Vortec Cyclone Melter System

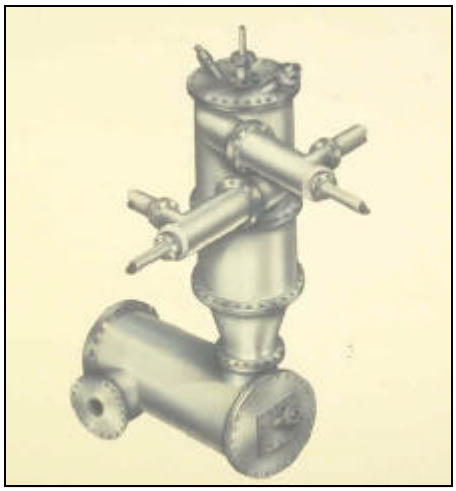
Developer: Vortec Corporation
Contract Number: DE-AC21-92MC29120
Crosscutting Area: N/A

Mixed Waste FOCUS AREA

Problem:

Innovative and cost-effective technologies for the treatment of soils containing hazardous and/or radioactive constituents are required to meet Department of Energy (DOE) Environmental Restoration and Waste Management (ER&WM) needs. There is a particular need for innovative technologies capable of treating a wide variety of mixed wastes with radionuclides and PCBs.

Solution:



An innovative fossil fuel fired vitrification process for remediation of soils containing hazardous and/or radioactive constituents is being developed. This process is an extension of an advanced, multifuel-capable, combustion and melting technology being developed for commercial glass manufacturing and waste processing/recycling with funding support from DOE and the environmental Protection Agency (EPA). The unique features of this technology provide the potential for a cost-effective, environmentally safe process for the vitrification of soils, sediments, sludges, and mill tailings containing organic, metallic, or radioactive contaminants.

Benefits:

- The Vortec Cyclone Melting System (CMS™) has demonstrated flexibility in effectively processing a wide variety of solid wastes and accommodating substantial variations in feed stock
- Ability to produce a glass product which provides long-term immobilization of heavy metals, toxic organics, and radionuclides
- High throughput (36 ton/day demonstration plant), multi-fuel capability, high thermal efficiency, and transportable
- Ability to oxidize and vitrify waste materials introduced as slurries, thus providing the capability for mixing contaminated or waste oils with various types of hazardous solids, soil wash process sediments, and mill tailings
- Effective oxidation and destruction of organic contaminants in the feedstock including polychlorinated biphenyls (PCBs)
- The CMS™ has achieved a state of technical readiness to allow commercial-scale waste vitrification
- Preliminary cost comparisons indicate significant remediation cost savings relative to existing joule melting and plasma heating processes
- Reduction of health and environmental risks

Technology:

The CMS™ is a technically and environmentally sound technology which is cost effective in the processing of contaminated soils and a wide spectrum of mixed wastes. The CMS™ is a particularly cost effective process for the vitrification of soils, sediments, sludge, and other wastes containing organic, metallic, or radioactive contaminants. Many of the benefits of the technology,

recognized by the glass and hazardous waste management industry, apply equally well to DOE's waste management and remediation needs.

In numerous pilot scale tests conducted by Vortec, the CMS™ has demonstrated the ability to effectively process wastes regulated under Resource Conservation and Recovery Act (RCRA), as well as surrogate contaminated soils. Simulated radionuclides and RCRA metals are effectively retained in the glass product and do no leach when tested using both Product Consistency Test (PCT) and Toxicity Characteristic Leaching Procedures (TCLP).

The primary components of the basic CMS™ are a counter rotating vortex (CRV) combustor and a cyclone melter. A unique feature of the process is the rapid suspension heating and oxidation of feedstock materials in the CRV heater prior to the physical chemical melting processes which occur within the cyclone melter. The use of the Vortec CRV combustor in conjunction with the cyclone melter distinguishes the Vortec combustion and melting technology from other types of cyclone combustion systems. In the CMS™ process, granular glass-forming ingredients and other feedstocks are introduced into the top region of the CRV combustor along with fuel and combustion air. As a result of the intense counter-rotating vortex mixing, it is possible to achieve stable combustion in the presence of large quantities of inert particulate matter. Both convection and radiation heat transfer mechanisms contribute to the rapid heating of the feedstock materials within the CRV heater. Any organic contaminants in the feedstocks are also effectively oxidized. The flue gas exiting the separator/reservoir is treated in an air pollution control (APC) assembly prior to being exhausted out the stack.

Contacts:

Vortec develops CMS technologies to meet DOE's needs in environmental restoration and waste management. For information on this project, the contractor contact is:

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DOE's Federal Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

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